Governor's Task Force on Science, Technology, Engineering and Math Education (STEM)

Wednesday August 13, 2014

Manchester Community College, Manchester, NH

Task Force Members in Attendance:	Ross Gittell, Chairman; Brian Blake; Barbara Couch; Susan D'Agostino; Mary Kate Hartwell, Joseph Helble; Caroline Herold; Robert Hollowell; Paul Leather and Palligarnai Vasudevan.
Unable to Attend:	Joyce Craig, Jeremy Hitchcock; Dean Kamen; Todd Lamarque
Others present:	Kerry McHugh, representing Governor's representative; Dr. Karen Erickson, Dean, School of Arts and Sciences, Southern New Hampshire University; Cynthia Dunlap, Professional Development Chair, New Hampshire Society for Technology in Education (NHSTE); Lynn Stanley, LICSW, Lead, New Hampshire Afterschool Network; Vincere Ceour DeLumiere (Northfield, NH), community college student.

I. Call to order

Chairman Gittell opened the meeting at 4:15 p.m. by welcoming members of the Task Force and the public who were present at the meeting.

II. Approval of July,16, 2014 minutes

Robert Hollowell made a motion to accept the minutes. Susan D'Agostino seconded. The minutes were approved unanimously.

III. Items requiring discussion

a. Taskforce members reviewed 13 primary recommendations to determine: (a) boldness of the recommendation (importance to moving STEM education forward in NH); (b) the need for further clarification and (c) identification of gaps and overlaps. In addition, a "parking lot" list of ideas to consider for future incorporation. (See addendum A for a summary of these deliberations and ideas for future incorporation).

Next Steps:

The chairman informed the taskforce that following their review of draft deliberations (see Addendum A); they would be asked to select work groups to develop the next phase of recommendations. Emails would be sent to them by August 16, 2014 and the chairman asked that members respond with comments by August 18.

b. The chairman also informed the taskforce that a schedule of meeting dates from September through November had been developed and would be emailed for final review before posting on the public websites.

c. The next meeting of the Task Force is scheduled for August 25 from 4 -6pm. Location to be determined.

IV. Public input:

a. Ms. Cynthia Dunlap, Chair, Professional Development, New Hampshire Society for Technology in Education (NHSTE) complimented the Taskforce on its thorough work in reviewing the 13 recommendations and preparing for the next steps.

a. Mr. CeourDeLumiere (Northfield, NH), community college student, asked the taskforce to consider how STEM might be taught more effectively by taking into consideration different learning styles. He pointed out that STEM has been traditionally taught without much applied "hands on" experiential learning which is essential for kinesthetic learners. He urged them to include learning styles in their final recommendations and offered to assist in gathering research they might find helpful.

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ADDENDUM A

Preliminary Recommendations, comments and actions: August 13, 2014

GROUP 1: C-CUBED

Action: combined Team A1 C-CUBED-challenges, competitions and capstones/ include elements of Team C1 Engineering &Technology curricula

TEAM A1 C-CUBED-CHALLENGES, COMPETITIONS AND CAPSTONES

Creates curriculum pathways beginning in 3rd grade to offer students a rotating series of different learning opportunities beginning with a "challenge" (thematic project which integrates STEM topics), "competition" (which encourages collaborative team work on STEM-related district wide competitions), and a "capstone" project (which requires research, development and presentation of original work in STEM).

TEAM C1 ENGINEERING&TECH CURRICULA

Recognizing the ubiquitous role of technology and engineering design thinking in 21century careers, recommends no "one size fits all" curricula for engineering and technology but rather the creation of a broad set of options including focus on experimental, self-discovery opportunities such as FIRST robotics, biological science

Comments and suggestions for incorporation:

- Consider alignment to Next Generation Science Standards so that "challenges, competitions and capstones" work in harmony with one another. However, the focus is on a broad engagement of students to meet variety of interests, so student engagement should not be sacrificed to perfect alignment. NOTE: Does this apply Common Core as well?
- Incorporate Engineering and Technology curricula into mix. E&T team (C1) suggested creating a technology/engineering portfolio in elementary, middle and high school, perhaps as part of a capstone. In addition to FIRST (as part of a technology/engineering opportunity), students should be able to work in other areas as well such as nano or biotechnology. This portfolio might also include EiE (Engineering is Elementary) for Grade 1-5.
- Give special attention to creating opportunities of interest to girls; including ARTS in STEM activities and giving an international perspective.

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GROUP 2: NH STEM CENTERS OF EXCELLENCE

Action: Moved to next phase of development"

NH STEM CENTERS OF EXCELLENCE

Creates a network of STEM Centers of Excellence for students who have a special interest and talent in STEM subjects. (1)New Hampshire Math and Science Academy and (2) New Hampshire CTE /STEM Early College Academies. Both schools will conduct STEM statewide outreach to K-12 students through activities including extracurricular, co-curricular and summer programs, and teacher professional development in STEM

Clarifying questions: How many exist in NH now? Four applications are pending and one exists?

Comments and suggestions for incorporation:

- Might consider narrowing the range (scope) as the recommendation attempts to cover a lot of ground. For example, career and academic pathways counseling might be better served under the Pathways recommendation.
- Review each element to tighten focus to ensure recommendation remains true to its intent.
- Also, a more explicit description of the specific outreach by the Centers will help to clarify the recommendation's intention (more in keeping with outreach of St. Paul's into the NH community).

GROUP 3: STEM SUPPORT NETWORK

Action: Combined Team A3 STEPS / Team B3 STEM Centers, Ambassadors & Champions

TEAM A3 STEPS (STUDENTS, TEACHERS, EMPLOYERS, PARENTS AND SCIENTISTS)

Creates a *NH Innovation Lab* to organize and house various STEM activities including (1) a mobile (traveling) STEM science center to reach all districts of NH, especially rural districts; (2) a business-educational-scientific professional collaboration to suggest methods to effectively integrate STEM curriculum into math and ELA (mandatory subjects in K-8), provide speakers and mentors in schools, externships for students and teachers, develop activities to engage and inform parents about STEM opportunities for their children.

TEAM B3 STEM CENTERS (HUBS), AMBASSADORS&CHAMPIONS

Regional STEM hubs offer teachers the ability to become part of a larger Professional Learning Community and enhance professional practices. Teachers and administrators can connect with other schools, and *particularly businesses*, that can offer assistance in and out of the classroom, through

technology, training and resources; Centers would house space for students to tinker and explore (similar to UNH Discovery Lab), and store STEM teaching materials (STEM packs) for use by K-6 teachers (who often lack math and science training).

Comments and suggestions for incorporation:

- Include the currently available online support materials available through the State.
- Clarify and define "STEM Packs," their role and benefit to supporting teachers
- Consider current situation where commercial materials for teacher support often go under-utilized, and numerous of these kits or packs are on the market of varying quality. If recommended, how to ensure quality and developmental-age approach fit for grade levels?

GROUP 4: CURRICULUM INTEGRATION

Action: Combined Team A4 iSTEM / Team B2 Curriculum Integration

TEAM A4 iSTEM (INTEGRATED STEM IN THE CLASSROOM**)**

Brings together disparate concepts including: (a) creation of STEM labs (as opposed to science labs) where students can "tinker" with engineering items for individual discovery and creative time; (b) hiring STEM specialists who rotate among schools (similar to Arts, Music specialists); (b) creating STEM learning opportunities by utilizing respected K-12 educational programs such First robotics, Intel science, Project Lead the Way; (c) creating STEM time within math and ELA teaching; (d) scheduling professionals in science and technology to visit schools.

B2: CURRICULUM INTEGRATION

Recommends a coordinated and collaborative effort for teachers in STEM: (a) Designate a "Year of STEM" to focus academic, business and community efforts in support of building statewide shared STEM learning resource curriculum and activities; (b) Establish positions as STEM "master" teachers who can serve as navigators, especially in K-5 and Middle schools, to help integrate STEM into math, English Language Arts and Arts curriculum, and to mentor teachers in creating applied and integrated STEM learning opportunities for students (c) Promote teaching of project-based learning in STEM through authentic problems, exposure to multidisplinary subjects, working in teams, reflecting on the process of problem-solving and building real artifacts and (d) Develop or adapt "best practice" models of K-12 STEM curricula (especially integration of STEM academic and CTE education) and make readily accessible to educators via a digital commons or other collective, collaborative resources

Comments and suggestions for incorporation:

- Keep existing standards and requirements in mind when developing curriculum not as limitations but as issues to address (such as changes to standards and requirements if necessary to achieve curriculum integration).
- Consider role of standards such as Next Generation Science Standards currently being adopted (local control) in SAUs in NH.
- Define terms.

GROUP 5: PATHWAYS

Action: Moved to next phase of development

TEAM A5 PATHWAYS FOR STUDENTS:

Pathways to successful careers are made available to all students, college bound and not. Recommends preparation of school guidance counselors, mentors and other to guide students with introduction to career options and proposes to create a ladder of career exposure suitable for each grade level beginning in G6. Every student should have an individualized pathway plan (IPP) that guides the student throughout their educational experience.

Comments and suggestions for incorporation: Further expansion of the idea with specifics.

GROUP 6: TEACHER PREPARATION AND PROFESSIONAL DEVELOPMENT

Action: Combined Team B1 and C4: Teacher Preparation and Professional Development

TEAM B1 TEACHER PREP AND PD

Recommends providing pre-service and in-service professional development in STEM content and pedagogy, especially for K-6 early education teachers through tuition incentives; implementing math specialist positions (approved by NH DoE) who might also serve STEM specialist positions; offer "Elementary STEM Teacher" endorsements through Bureau of Credentialing, integrate STEM training for all K-6 elementary teacher preparation programs and establish professional development for certified teachers to become "STEM Leaders."

TEAM C4 TEACHER PREP AND PD

Recommends teacher preparation programs for elementary education to increase the requirements for the teaching of science (in particular) and the use of scientific inquiry as a component of lesson planning. Also recommends annual "boot camp" type professional development opportunities for teachers at the elementary level to bolster their comfort with teaching science by modeling lessons and giving teachers feedback on their own lessons.

Comments and suggestions for incorporation:

- Connect to how curriculum is delivered
- Expose teachers to industry involvement (such as externships)
- Consider requiring a more formalized role of coaching and mentoring (rather than ad hoc as it is in some school districts)
- Consider building opportunities for professionals in STEM careers who want to become teachers (mid-careers or retirees: consult IBM model)
- Focus on incentives and empowerment education for certified teachers (especially elementary school teachers with no math or science background) to encourage them to expand professional learning an credentials

GROUP 7: MATH CURRICULA PATHWAYS

Action: Moved to next phase of development

TEAM C2 MATHEMATICS CURRICULA

Recommends "coding" course as a foundational course in K-12 to build logical and analytical skills. Three pathways to fulfill math requirements are recommended to create flexibility geared to student interest but all three pathways prepare students for college. Path #1 includes calculus (following algebra, geometry, trigonometry, coordinate geometry and possibly statistics) particularly useful for careers in physical sciences and engineering; Path #2 focus toward statistical thinking including data science and data visualization suitable for many careers including business, analytics, biological science, health sciences, engineering and computer science; Path #3 focuses on linear algebra (algebra and geometry) which is also suitable for many careers including math, computer science and engineering.

Comments and suggestions for incorporation:

- Ensure balance between abstract and applied math.
- Consider role of competency/mastery based learning. In particular, consider the role of the Smarter Balanced testing starting in 2015 in NH in K-12.
- Acknowledge grading practices and biases in favor of certain types of math courses considered to be appropriate preparation for college and potential limitations of student options if a particular pathway is pursued
- Define more precisely the coding experience recommended and the frequency
- Define terms in more detail (such as "college-level prep" math course) and expectations

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GROUP 8: NEXT GEN SCIENCE STANDARDS integrating Engineering & Technology

Action: Moved to next phase of development

TEAM C3 NEXT GEN SCIENCE STANDARDS

Adopt Next Generation Science Standards (NGSS) to replace NH current standards that were adopted in 2006. NGSS incorporates practices, crosscutting concepts and core ideas include Science, Math, and Language Arts; Standards are written as performance expectations which are NGSS requires students to analyze, argue, construct, design, and develop, which are all characteristic of 21st Century skills

Additional reference for E&T
TEAM C1 ENGINEERING&TECH CURRICULA

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Comments and suggestions for incorporation:

- When developing NGSS recommendation for next round, suggested that consider challenges to a new science standard so that they are sufficiently addressed.
- Consider explaining the value of NGSS as a tool and guide for teachers in K-12 (and why a tool and guide of this nature is needed). How does this advance STEM education and 21st century learning skills?
- Define terms: what does adoption mean/not mean?

TEAM C5 STEM.NGSS COORDINATOR –Tabled until next round; Consider including digital literacy into coordination. TF members encouraged to consider how best to articulate the scope and depth of a coordinator role, responsibilities and accountabilities.

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PARKING LOT: FOR IDEAS TO CONSIDER AND/OR INCLUDE IN FINAL RECOMMENDATIONS

Draft August 13, 2014

1. Girls in STEM

2. Rural students (lacking easy access to resources)

3. Administrative structure to oversee implementation and accountability for STEM recommendations

4. Home schooled students

5. STEM online courses such as Virtual Learning Academy Charter School (Exeter, NH)

6. Inclusion of international assessment standards in the mix

7. Inclusion of the Arts

8. Inclusion of professional school counselors and college admissions directors

9. Consider incentives to encourage STEM mastery for teachers

10. Include consideration of expectations of each group to be impacted and/or tasked with implementation of a taskforce STEM recommendation

11. Consider coordinator functions (those charged with implementing STEM recommendations) to ensure a cohesive set of responsibilities; consider separating oversight for Common Core English Language Arts/Math and science/Next Generation Science Standards